

THAT WHICH IS CLAIMED IS:

1. Semiconductor device for electro-optic applications of the type including at least a rare-earth ions doped P/N junction integrated on a semiconductor substrate, a cavity or a waveguide and a coherent light source, characterised in that said coherent light source is obtained incorporating said rare-earth ions in the depletion layer of said P/N junction.
2. Semiconductor device according to claim 1, wherein said P/N junction is reverse biased.
3. Semiconductor device according to claim 1, wherein said rare-earth ions doped P/N junction is the base-collector region of a bipolar transistor.
4. Semiconductor device according to claim 1, wherein said rare-earth ions are Erbium ions.
5. Semiconductor device according to claim 1, wherein said cavity or waveguide includes said P/N junction and is partially enveloped by a protective layer having a lower dielectric constant with respect to said junction.
6. Semiconductor device according to claim 1, wherein a buried reflecting layer is provided to delimit the bottom of said waveguide.
7. Semiconductor device according to claim 1, wherein said semiconductor substrate is a SOI substrate.

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15. Semiconductor laser device according to claim 10, wherein said cavity or waveguide includes said P/N junction and is partially enveloped by a protective layer having a lower dielectric constant with respect to said junction.

5 17. Semiconductor laser device according to
claim 10, wherein said semiconductor substrate is a SOI
substrate.

19. Semiconductor laser device according to claim 10, wherein a buried reflecting layer is provided to delimit the bottom of said waveguide.

21. A method for manufacturing a semiconductor device for electro-optic applications, said device including at least a rare-earth ions doped P/N junction integrated on a semiconductor substrate, characterised in that of providing a cavity or waveguide in said semiconductor substrate and a coherent light emitting source incorporating said rare-earth ions in the depletion layer of said P/N junction.

22. Method according to claim 21, wherein a biasing device is also provided to bias said P/N junction.

23. Method according to claim 21, wherein said biasing device is a bipolar transistor and said rare-earth ions doped P/N junction forms the base-collector region of said bipolar transistor.

24. Method according to claim 21, wherein said rare-earth ions are Erbium ions.

25. A method for manufacturing a semiconductor laser device for electro-optic applications, said device including at least a rare-earth ions doped P/N junction integrated on a semiconductor substrate, characterised in that of providing a cavity or waveguide in said semiconductor substrate and a coherent light emitting source comprising a biasing device and a concentration of said rare-earth ions in the depletion layer of said P/N junction.

26. Method according to claim 25, wherein said biasing device is a bipolare transistor and said rare-earth ions doped P/N junction forms the base-collector region of said bipolar transistor.

27. Method according to claim 25, wherein said rare-earth ions are Erbium ions.

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